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Healthcare Monitoring System by using iSense Device& IOT Platform

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ABSTRACT

In the recent years Wireless Sensor Network have given rise to many healthcare applications. As the cost and size of sensor devices are decreasing fast, the application areas of wireless sensor networks have also expanded rapidly.iSense are the WSN devises works under the 802.15.4 IEEE standard iSense gives both hardware and software solution to build wireless sensor application. So in this paper we used both hardware and software part of the iSense. We connected our Sensor data to the internet of things (IOT). We use some of cloud services to stores patient's records over the cloudDatabse. MongoDB is a schema less database tool which gives interface to store patient's records on cloud.In this paper we use cloud service as DaaS (Database as a Service). The MongoLab provides the DaaS from different service providers like Microsoft Azure, Google etc, so that our sensor data can stored on cloud by getting the services. Finally the patient's body temperature, body activity status, alcohol content in the body all these records processed by the isenseCoremodule and can stores data on cloud, so that respective patient's physicians can take effective and quick decisions to improve patient life by accessing cloud data from different remote locations.

KEYWORDS: *iSense, Sensors, IOT,MongoDB, MongoLab.*

I. INTRODUCTION

Healthcare is the act monitoring the patients in healthy way or necessary medical procedures to improve a person's well-being. The services are typically offered through a health care system made up of hospitals and physicians and majorly monitor by health professionals Like Doctors. WSN has huge application and recent, emerging technology in the healthcare field[1].

Sensors today are effective for single measurements and are not integrated into a complete body area network, where many sensors are working simultaneously on an individual patient.The type and number of sensors must be configured according to monitoring needs related to different diseases, treatment, and the patient treatment life cycle[2][3].

In this paper we use iSense technology which works under the WSN of IEEE standard 802.15.4, in other words iSense are the Wireless sensor devices which gives both hardware and software solution to build many applications[4]

Once after collecting the patient information from the sensors, we can make available of patient data over the cloud by taking the services from service provider of the cloud. This make more reliable of this paper so that the physicians and other doctors of the respective patients can view their patients records irrespective of their location at a time. And the records of the patients can be stored for long time which may help to take decision in the research and to analysis the patients. Three sensors lm35, MQ-3 and flex sensors to detect patient's body temperature, alcohol content in the body, and body activity status. This paper include the IOT part i.e. we are connecting of sensor things to the internet so that patients readings can be viewed by the remotely located doctors which helps to take better and quick decisions to cure patient's deices[5]. WSN, iSense, and IOTpart(cloud)are the main concepts. From the cloud service providers we will get DaaS

(Database as a Service) in Mongo Lab. To store patient records locally (base stations) we will use MongoDB database (Schema less database). To store over the cloud we will use service DaaS in Mongo Lab from the Microsoft Azure service providers[6].

A. *iSense*

iSense are the wireless sensor devices, which works on the technology called WSN (wireless sensor network). iSense includes the number of modules and sensor modules. And it works under the IEEE standard 802.15.4. It is based on object oriented programming in C++.iSense provides us both hardware and software solution to build the WSN applications. And includes the Software system Functionalities like Routing, Time synchronization, Reliable Transport of single packets as well as streams, OS-like services, Platform independent drivers for a broad variety of sensors and other extensions. the some of the OS like functionalities like Timeouts and task management to facilitate application and protocol development, Automatic power management to support lowest power sleeping of sensor nodes, Radio packet handling. iSense offers an ipv4 and ipv6 dual network stack to easily manage wireless sensor nodes into the internet. Based upon the iSense OS and networking firmware. Within the sensor network, the 6loWPAN protocol suite is used to transmit ipv6 datagram over IEEE 802.15.4 link layer radio interface.iSense offers the hardware devices in this paper we use core module, gateway module, Battery modules, Extension module.

B. *Proposed System*

The various sensors consistently gets the patient's vital signs, such as body activity, alcohol content and body temperature. The sensors collects the patient-related readings and core module reads the sensor data and process the analog data from the sensors and convert it into human readable values and transmit into the base station or destination node(another core module), Once core module receives patient's data display the data on PC/LAPTOP monitor by using iShell tool. Finally we can read the data into .json or .csv format file. Perform further data processing in PC/LAPTOP to transfer the .json and .csv files into cloud by using MongoDB tool by using command prompt. Then patient's data will available on cloud in Mongolab (DaaS). Then remotely located doctors can view patient's records at a same time and can stores permanently for future to take decisions and for other purpose. The remotely located authorized doctors can access data on cloud through MongoDB tool.

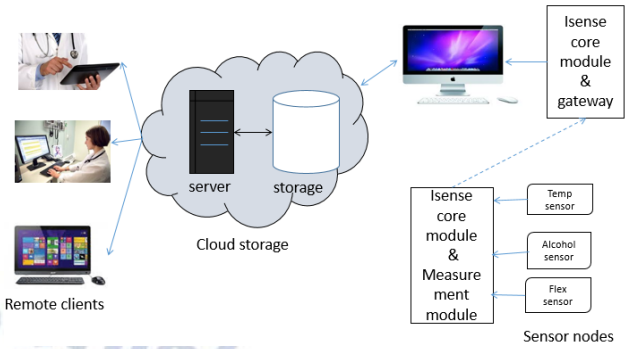

Fig 1: Block Diagram of Proposed System

II. System Design

The system design mainly include three group sender part, receiver part, cloud part, the both sender and receive part is deal with core module.The core module include Jennic5418 microcontroller and RF transciver real time clock(RTC). The iSense Core Module provides the basis of the iSense modular hardware platform for all kinds of wireless sensor networking applications,the iSense Core Module is based on a Jennic JN5148 wireless microcontroller, a chip that combines the controller and the wireless communication transceiver in a single housing. The data can be send and recevier by using either broadcast or unicast method.In the Broadcast method RF sends data by using broadcast addressing method so that one or more coremodules can receive the same data .while in the case unicast addressing method the sender usese the particular MAC address of the receiver coremodule . some of the Core module features is as follow.

1. IEEE 802.15.4 compliant radio: 250 kbit/s, hardware AES encryption
   - Single chip solution of controller and radio: no need to transfer the AES key over an unsecure SPI bus.
   - Time-of-flight ranging engine.
   - Up to 600kbit/s in high data rate modes.
   - 3 antenna options: integrated PCB antenna (CM30I), µFL connector (CM30U), power amplifier with µFL connector (CM30HP).
2. Outstanding computational power:
   - 32-bit RISC Controller.
   - Up to 32MHz, true 1DMIPS/MHz .
   - 128kB RAM, 512 kB serial Flash
3. High power efficiency:
   - TX: 13.4mA (CM30I, CM30U), 108.4mA (CM30HP)

- RX: 15.9mA (CM30I, CM30U), 21.4mA (CM30HP)
- CPU @ 16 DMIPS: 6mA

CPU @ standby: 3,75µA (regulator disabled)

4. Rich peripherals: I2C, SPI, a 4 channel 12-bit ADC, two 10-bit DACs, two UARTs
5. Ultra-stable (10ppm) real time clock.
6. Software controllable voltage regulator: can be disabled in software when not required to omit regulator losses.
7. Expansion connectors for all kinds of other modules and energy sources.

The iSense Gateway Module provides connection to other systems such personal computers using USB It enables data exchange as well as serial programming of connected core modules The iSense Gateway Module 2 provides interconnection with other systems such as personal computers using a serial connection via USB. It enables data exchange as well as programming of connected iSense Core Modules and can also be used to power other attached iSense modules, including the Lithium-Ion Rechargeable Battery Module

The Measurement module provides the interfacingwith the compact 34-pin inter-module connector. It include the interfaces with the core module, I2C, SPI with 3 select pins, 2x UART, Most of the above can be used as GPIO pins alternatively, 3x ADC in, 2x DAC out, RESET, VCC and GND.

A. *Flow Diagram*

In the figure 2 it shows that dataflow over the two core module where one core module transmit the sensors data and remaining will be receiver by using the inbuilt RF transceivers. The data send/receive take place by using broadcast or unicast addressing mode. Finally the patient records stores in local database server or any directory of PC/LAPTOP.

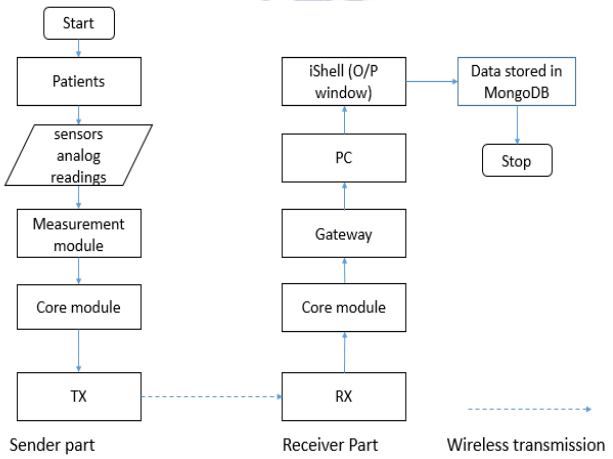

Fig 2: Data flow over sender and receiver part.

In the figure 3 it clearly shows the steps to import patient records to cloud it is done by MongoDB tool which provides the interface to connects with the cloud(MongoLab) with the right URI. And by using mongoimport command with the right authentication credentials (username, password, input filename, collection name) we can import records to cloud database.

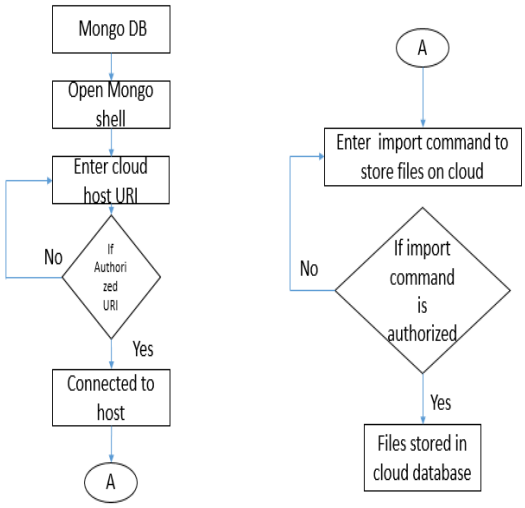

Fig 3: Steps to Import file to MongoLab Database.

In the same way we can export the patient's record from the cloud database from the various remote location using the right remote database URI and mongoexport command with the right authentication credentials (username, password, output filename, and collection name) as shown in the figure 4.

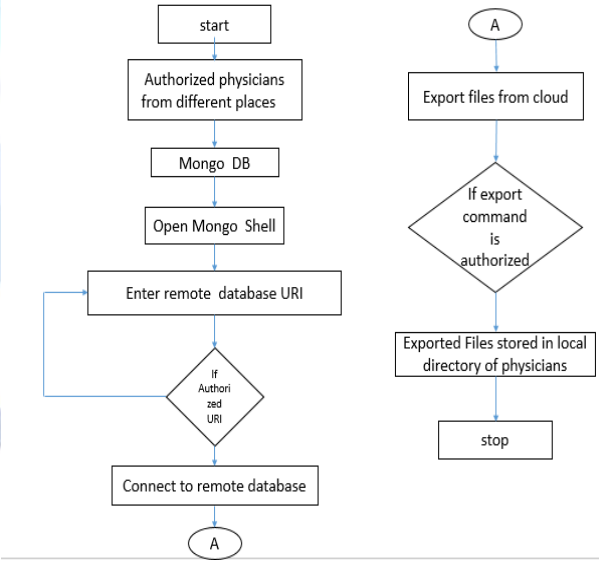

Fig 4: Steps to Export file from MongoLab Database.

B. *Use case Diagram*

Use cases are the process of deriving the system requirement through observation of existing system, discussion with potential users and procures, the figure 5shows relation of the admin

functionality, the account holder of the MongoLab become an Admin he can do following activities.

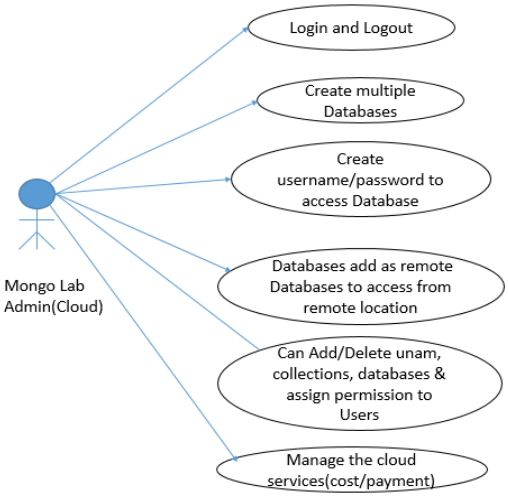

Fig 5: MongoLab Admin activities.

III. RESULTS

The proposed system is successfully implemented and designed outputs are obtained. the sensor nodes starts sensing the physical conditional parameter of the patients and are displayed on the serial monitor of the iShell and simultaneously results are stored in PC/LAPTOP and the same results are uploaded to the cloud successfully. The authorised persons can access the data from any place at any time.

The figure 6 shows project module of sender and recevier part and desired output are successfully obtained.

The figure 7 shows obtained results of temperature in centigrade, alcohol content in the body and body activity status.

The figure 8 shows the databases and remote databases created in the MongoLab to push our data and to access from the remote location from different authorisers.

The figure 9 shows the data import and export from the remotly located physicians.

Fig 6: Project Module

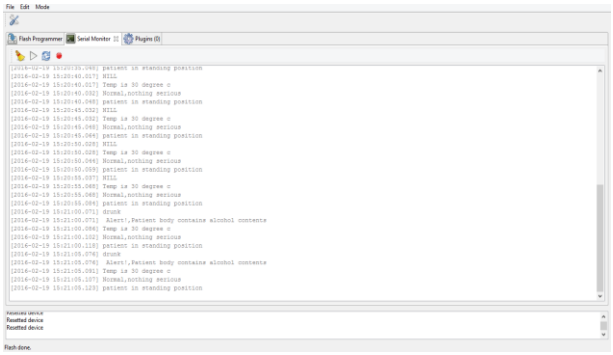

Fig 7: Project Output on iShell Serial Monitor

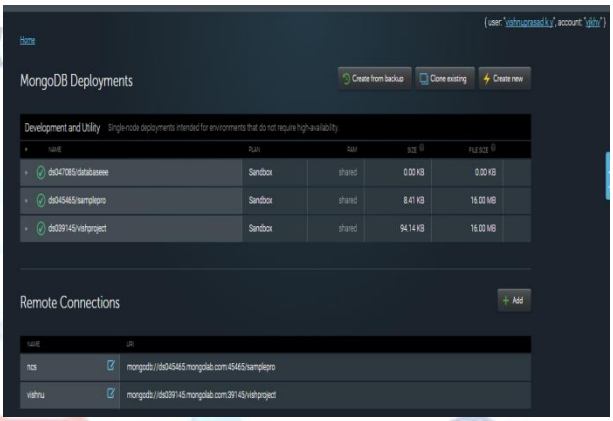

Fig 8: Database & Remote databse on MongoLab(Cloud).

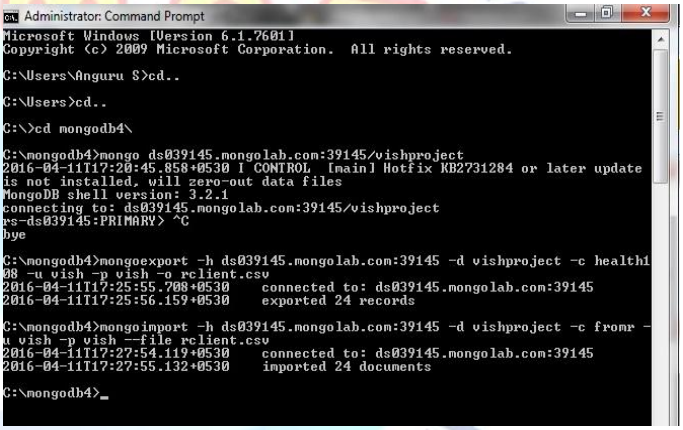

Fig 9: Different Authorisers data access from cloud

IV. CONCLUSION

This project gives better solution in the field of medical to monitor the patients and also it helps to nurses and doctors to take care of patients. From this project we can get more benefits in the field of healthcare monitoring. This application is able to continuously monitor the patient's body temperature, alcohol content in the body and body activity. This new technology has potential to offer a wide range of benefits to patients, medical personnel, and society through continuous monitoring. And also it provides the quality and efficiency of care, cost effectiveness. And also this project gives the better solution in healthcare monitoring system with both patients and doctors satisfaction.

REFERENCES

[1] D. Benhaddou, M. Balakrishnan, and X. Yuan,"Remote Healthcare Monitoring System Architecture using Sensor Networks", Region 5 Conference, July, 2008 IEEE, dio: 10.1109/TPSD.2008.4562760.

[2] A. Cerpa, J.Wong, L. Kuang, M. Potkonjak, and D. Estrin, Statistical Model of Lossy Links in Wireless Sensor Networks, IPSN, April 2005.

[3] Dr.Kathir.Viswalingam1, G.Ayyappan2 Dean (R&D), Bharath University, Chennai, India1 Assistant Professor, Department of Information Technology, Bharath University, Chennai, India2

[4] iSense APIs http://www.coalesenses.com/doxygen/annotated.html

[5] Health Insurance Portability and Accountability Act of 1996. Public Law 104-191. [Online]. Available: http://www.cms.hhs.gov/hipaageninfo/

[6] http://ehrscience.com/2013/04/15/investigating-nosql-for-ehr-systems-mongodb/